

CLAIMS

What is claimed:

1. An injection device comprising a syringe cartridge including a needle for delivery of a medicament, a trigger mechanism, a drive mechanism and a bias
5 mechanism, wherein the injection device is configured to provide automatic injection of a desired dose of the medicament followed by automatic retraction of the needle associated with the syringe cartridge and the drive mechanism includes a compound plunger, wherein the compound plunger comprises an outer plunger forming a first reservoir, a hydraulic fluid contained within the first reservoir, a hydraulic orifice, and
10 an inner plunger positioned at least partially within the outer plunger, the inner plunger being positioned and configured such that, as the drive mechanism operates, the inner plunger acts against the hydraulic fluid and the hydraulic fluid is expelled from the first reservoir through the hydraulic orifice.
- 15 2. The injection device of claim 1, further comprising a second reservoir configured to contain the hydraulic fluid expelled from the first reservoir.
- 20 3. The injection device of claim 1, further comprising a second reservoir configured to contain the hydraulic fluid expelled from the first reservoir, wherein the second reservoir is at least partially formed by a sealing member included on an outer surface of the outer plunger.

4. The injection device of claim 1, further comprising a second reservoir
configured to
contain the hydraulic fluid expelled from the first reservoir, wherein a proximal
boundary of the second reservoir is formed by a sealing member included on an outer
5 surface of the outer plunger and a distal boundary of the second reservoir is formed by a
piston positioned within the syringe cartridge.

5. The injection device of claim 1, further comprising a second reservoir
configured to
10 contain the hydraulic fluid expelled from the first reservoir, wherein a sealing member
included on an outer surface of the outer plunger and a piston positioned within the
syringe cartridge form two walls of the second reservoir and the sealing member is
disposed around the outer surface of the outer plunger such that the sealing member
forms a slidable seal.

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6. The injection device of claim 1, further comprising a second reservoir
configured to
contain the hydraulic fluid expelled from the first reservoir, wherein a sealing member
included on an outer surface of the outer plunger forms a proximal wall of the second
20 reservoir and a piston positioned within the syringe cartridge forms a distal wall of the
second reservoir sealing member is disposed around the outer surface of the outer
plunger such that the sealing member forms a slidable seal and the sealing member is
slidable relative to the outer plunger.

7. The injection device of claim 1, wherein the drive mechanism comprises a spring.
8. The injection device of claim 1, wherein the bias mechanism comprises a spring.
9. The injection device of claim 1, wherein the inner plunger further comprises a decoupling mechanism formed integrally therewith.
10. The injection device of claim 1, wherein the inner plunger includes a decoupling mechanism operatively associated therewith.
11. The injection device of claim 1, wherein the inner plunger includes a distal end and a sealing member near the distal end.
12. The injection device of claim 1, wherein the inner plunger includes a distal end and a piston near the distal end.
13. An injection device comprising:
a body incorporating a syringe cartridge, the syringe cartridge containing a medicament to be injected, including a needle through which the medicament can be injected , and being positioned within the body such that the syringe cartridge can be displaced back and forth within the body;

a bias mechanism configured to exert a first force against the syringe cartridge, which first force works to maintain the syringe cartridge in a retracted position within the syringe body;

5 a drive mechanism comprising an energy source, a drive member, a compound plunger,

and a decoupling mechanism, wherein the compound plunger includes an outer plunger forming a reservoir, a hydraulic fluid contained within the reservoir, a hydraulic orifice, and an inner plunger positioned within at least partially within the outer plunger, the drive mechanism being configured such that, upon actuation, the energy source, drive
10 member, compound plunger, and decoupling mechanism function together to effect automatic extension of the needle of the syringe cartridge from the body of the injection device, automatic delivery of a desired dose the medicament from the syringe cartridge, and automatic retraction of the needle after delivery of the desired dose of the medicament.

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14. The injection device of claim 13, further comprising a second reservoir configured to contain the hydraulic fluid expelled from the first reservoir, the second reservoir being partially formed between an outer surface of the outer plunger and the syringe cartridge.

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15. The injection device of claim 14, wherein a proximal boundary of the second reservoir is formed by a sealing member included on an outer surface of the outer plunger.

16. The injection device of claim 14, wherein a proximal boundary of reservoir
is formed
by a sealing member included on an outer surface of the outer plunger and a distal
boundary of the second reservoir is formed by a piston positioned within the syringe
5 cartridge.

17. The injection device of claim 14, wherein a proximal boundary of the
second reservoir is formed by a sealing member included on an outer surface
of the outer plunger and the sealing member is provided on the outer surface
10 of the outer plunger in a manner that sealing member provides a slidable
seal

18. The injection device of claim 14, wherein a sealing member included on an
outer surface of the outer plunger forms a proximal wall of the second
15 reservoir and a piston positioned within the syringe cartridge forms a distal
wall of the second reservoir and the sealing member is disposed around the
outer surface of the outer plunger such that the sealing member forms a seal
that is slidable relative to the outer plunger and to the syringe cartridge.

20 19. The injection device of claim 13, wherein the energy source of the drive
mechanism comprises a spring.

20. The injection device of claim 13, wherein the bias mechanism comprises a
spring.

21. The injection device of claim 13, wherein the inner plunger further comprises a decoupling mechanism formed integrally therewith.
- 5 22. The injection device of claim 13, wherein the inner plunger includes a decoupling mechanism operatively associated therewith.
23. The injection device of claim 13, wherein the inner plunger includes a distal end and a sealing member near the distal end.
- 10 24. The injection device of claim 13, wherein the inner plunger includes a distal end and a piston near the distal end.
25. An injection device comprising:
- 15 a body incorporating a syringe cartridge, the syringe cartridge containing a medicament to be injected, including a needle through which the medicament can be injected , and being positioned within the body such that the syringe cartridge can be displaced back and forth within the body;
- a bias mechanism configured to exert a first force against the syringe cartridge,
- 20 which first force works to maintain the syringe cartridge in a retracted position within the syringe body;
- a drive mechanism comprising an energy source, a drive member, a compound plunger,

and a decoupling mechanism, wherein the compound plunger includes an outer plunger forming a first reservoir, a hydraulic fluid contained within the first reservoir, a hydraulic orifice sized to prevent escape of the hydraulic fluid from the first reservoir by capillary action , and an inner plunger positioned within at least partially within the
5 outer plunger, the drive mechanism being configured such that, upon actuation, the energy source, drive member, compound plunger, and decoupling mechanism function together to effect automatic extension of the needle of the syringe cartridge from the body of the injection device, automatic delivery of a desired dose the medicament from the syringe cartridge, and automatic retraction of the needle after delivery of the desired
10 dose of the medicament.

26. The injection device of claim 25, further comprising a second reservoir configured to contain the hydraulic fluid expelled from the first reservoir, the second reservoir being partially formed between an outer surface of the outer plunger and the
15 syringe cartridge.

27. The injection device of claim 26, wherein a proximal boundary of the second reservoir is formed by a sealing member included on an outer surface of the outer plunger.

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28. The injection device of claim 26, wherein a proximal boundary of reservoir is formed by a sealing member included on an outer surface of the outer plunger and a distal boundary of the second reservoir is formed by a piston positioned within the syringe cartridge.

29. The injection device of claim 26, wherein a proximal boundary of the second reservoir is formed by a sealing member included on an outer surface of the outer plunger and the sealing member is provided on the outer surface of the outer plunger in a manner that sealing member provides a slidable seal

30. The injection device of claim 26, wherein a sealing member included on an outer surface of the outer plunger forms a proximal wall of the second reservoir and a piston positioned within the syringe cartridge forms a distal wall of the second reservoir and the sealing member is disposed around the outer surface of the outer plunger such that the sealing member forms a seal that is slidable relative to the outer plunger and to the syringe cartridge.

31. The injection device of claim 25, wherein the energy source of the drive mechanism comprises a spring.

32. The injection device of claim 25, wherein the bias mechanism comprises a spring.

33. The injection device of claim 25, wherein the inner plunger further comprises a decoupling mechanism formed integrally therewith.

34. The injection device of claim 25, wherein the inner plunger includes a decoupling mechanism operatively associated therewith.

5 35. The injection device of claim 25, wherein the inner plunger includes a distal end and a sealing member near the distal end.

36. The injection device of claim 25, wherein the inner plunger includes a distal end and a piston near the distal end.

10 37. An injection device comprising:
a body incorporating a syringe cartridge, the syringe cartridge containing a medicament to be injected, including a needle through which the medicament can be injected, and being positioned within the body such that the syringe cartridge can be displaced back and forth within the body;

15 a bias mechanism configured to exert a first force against the syringe cartridge, which first force works to maintain the syringe cartridge in a retracted position within the syringe body;

20 a drive mechanism comprising an energy source, a drive member, a compound plunger, and a decoupling mechanism, wherein the compound plunger includes an outer plunger forming a first reservoir, a hydraulic fluid contained within the first reservoir, a hydraulic orifice sized to prevent escape of the hydraulic fluid from the first reservoir by capillary action, and an inner plunger positioned within at least partially within the outer plunger, the inner plunger being positioned and configured such that, as the drive mechanism operates, the inner plunger acts against the

hydraulic fluid and the hydraulic fluid is expelled from the first reservoir through the hydraulic orifice; and

5 a second reservoir configured to contain the hydraulic fluid expelled from the first reservoir, the second reservoir being formed between an outer surface of the outer plunger, an inner surface of the syringe cartridge, a sealing member included on an outer surface of the outer plunger, and a piston positioned within the syringe cartridge, wherein the sealing member is disposed around the outer surface of the outer plunger such that the sealing member forms a seal that is slidable relative to the outer plunger and to the syringe cartridge.

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